

Electricity and Magnetism

Know the facts		Key words	
1	Objects can be charged positively or negatively by transferring electrons.	1	Negatively charged: An object that has gained electrons as a result of the charging process.
2	Like charges repel and unlike charges attract.	2	Positively charged: An object that has lost electrons as a result of the charging process.
3	An electric field is a region where there are forces on charged particles or materials.	3	Electrons: Tiny particles which are part of atoms and carry a negative charge.
4	Around a charged object, the electric field affects other charged objects, causing them to be attracted or repelled.	4	Charged up: When materials are rubbed together, electrons move from one surface to the other.
5	Current is a movement of electrons and is the same everywhere in a series circuit.	5	Field: The area where other objects feel an electrostatic force.
6	Current divides between loops in a parallel circuit and combines when loops meet.	6	Electrostatic force: Non-contact force between two charged objects.
7	Current makes components work.	7	Current: Flow of electric charge flowing per second, measured in Amps (A)
8	A component with a high resistance has a low current flowing through it.	8	Voltage: A measure of the strength of a cell or battery used to send a current around the circuit.
9	Resistance is measured in ohms (Ω).	9	Potential Difference: A measure of the push of a cell or battery, or the energy that the cell or battery can supply, measured in Volts (V).
10	To calculate resistance, you use this equation: Resistance = potential difference / current $\{R = V / I\}$	10	In series: If components in a circuit are on the same loop.
11	Magnets have a North and South pole. Like poles repel and unlike poles attract.	11	In parallel: If some components are on separate loops.
12	Current through a wire creates a magnetic field.	12	Conductor: A material that conducts charge or energy well, such as graphite or metal.
13	Magnetic field strength decreases with distance.	13	Insulator: A material that does not conduct electricity well.
14	An electromagnet is a coil of wire wrapped around a magnetic core.	14	Electromagnet: A non-permanent magnet turned on and off by controlling the current through it.
15	Magnets are used in Maglev trains, hospitals and cars.	15	Relay: Electrical device that uses current flowing through it in one circuit to turn on and off a current flowing in a second circuit.
		16	Motor: A component of machine that spins when a current flows through it.
		17	Core: Soft iron metal which the solenoid is wrapped around.

Bar magnets

Most materials are not magnetic, but some are. A magnetic material can be magnetised or will be attracted to a magnet. These metals are magnetic:

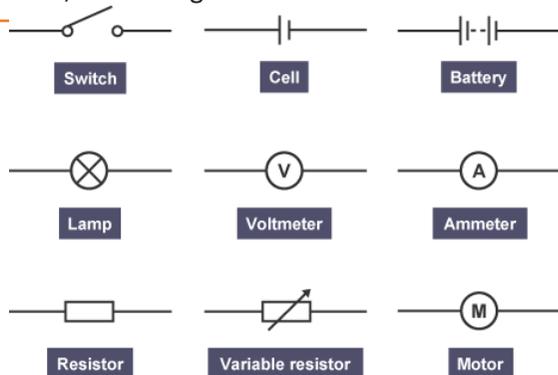
- iron
- cobalt
- nickel



Steel is mostly iron, so steel is magnetic too.

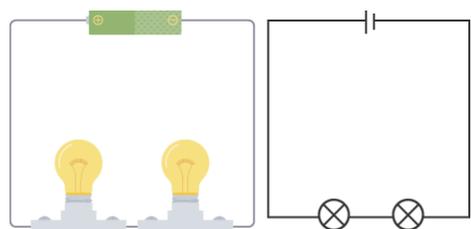
Circuit symbols

We use circuit symbols to draw diagrams of electrical circuits, with straight lines to show the wires.



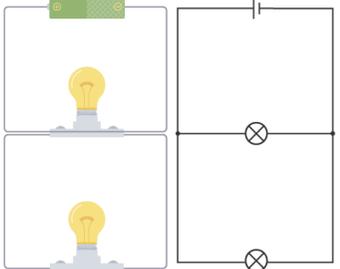
Series Circuit

(one pathway for current to flow)



Parallel Circuit

(more than one pathway for current to flow)



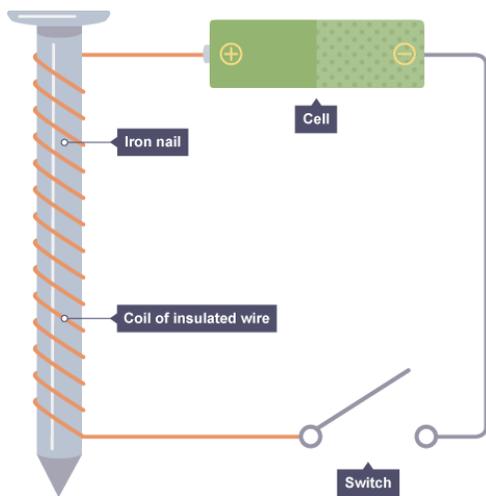
Electromagnets

When an electric current flows in a wire, it creates a magnetic field around the wire. This effect can be used to make an electromagnet. A simple electromagnet comprises a length of wire turned into a coil and connected to a battery or power supply.

You can make an electromagnet stronger by doing these things:

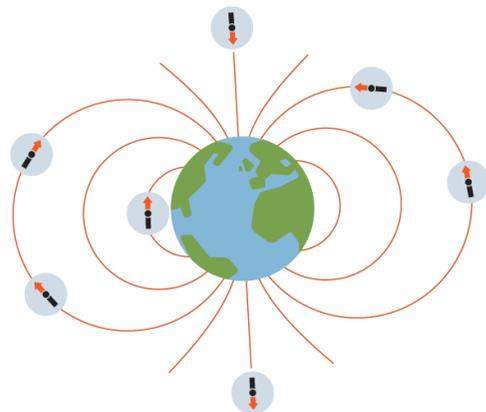
- wrapping the coil around a piece of iron (such as an iron nail)
- adding more turns to the coil
- increasing the current flowing through the coil

A simple electromagnet



The Earth's magnetism

The Earth behaves as if it contains a giant magnet. It produces a magnetic field in which the field lines are most concentrated at the poles. This magnetic field can be detected using magnetic materials or magnets.



The Earth's magnetic field affects the needles in compasses